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MILITARY THOUGHT (USSR): The Destruction of
Enemy Groupings with Nuclear Warheads
Using Surface Bursts            50X1-HUM

## The Destruction of Enemy Groupings with Nuclear Warheads Using Surface Bursts

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Nuclear surface bursts are still employed rarely in operational training or in troop exercises to accomplish various tasks in an operation. In our view, this is explained, on the one hand, by fear of the effect of radioactive contamination of the terrain on our own troops and fear of limiting their maneuver capabilities and, on the other hand, by an incomplete picture of the effectiveness of such bursts in destroying enemy personnel.

Indeed, if there is a moderate wind blowing toward our troops, there does exist a certain danger that our personnel will receive unacceptable doses of radiation, depending on the depth and yield of the nuclear strikes. Thus, in respect to the nuclear warheads considered in this article, the safety of our own troops can be assured only when destroying groupings which are at least 150 to 200 kilometers from the line of combat contact. If the wind is blowing toward the enemy, it becomes possible to destroy advancing troops only when they reach the areas in which the nuclear strikes are to be delivered or in actions on contaminated terrain (mainly when they are negotiating zones of radioactive contamination). However, 24 hours after the delivery of a group nuclear strike, the levels of radiation on the terrain will have become, for all practical purposes, harmless. In this case, the possibility of using surface bursts will be determined by the rates of advance. And it may be assumed that, on the average, under favorable conditions, group nuclear strikes with surface bursts can be delivered against enemy targets located at a distance of 50 to 100 kilometers from the forward units of the advancing troops.

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Regarding the effectiveness of such strikes, the following must be noted: it is precisely in destroying large groupings occupying sizable areas that radioactive contamination of terrain (together with other destructive factors) substantially increases the effectiveness of surface bursts in comparison with aerial bursts. In addition, surface nuclear bursts will not only destroy personnel and combat equipment in the enemy's operational rear but will create broad zones of radioactive contamination which will immobilize his troops and prevent the approach of reserves and the bringing up of materiel to the battlefield.

The present article offers an approximate methodology for planning the destruction of groupings of troops in concentration areas with surface nuclear bursts, and substantiates the need for calculating the destruction of enemy personnel from radioactive contamination of terrain.

\* \* \*

It is known that a surface nuclear burst causes radioactive contamination of terrain both in the area surrounding the center of the burst and along the path taken by the radioactive cloud. And although the zone of radioactive contamination of terrain in the center of the burst is considerably smaller than the total zone of destruction (from the shockwave, thermal radiation, and penetrating radiation) and does not inflict any additional destruction on the enemy within this area, enemy personnel along the path of the radioactive cloud may be destroyed at distances of tens, and sometimes even hundreds, of kilometers from the center of the burst.

The putting of personnel out of action during radioactive destruction depends on the dose of radiation they receive while on contaminated terrain. It is characteristic of this situation that the number of personnel put out of action by one and the same dose of radiation will change with time. Thus calculations show that if a dose of radiation equal to 300 roentgens is received, only 10 percent of the personnel will be put out of action during the first hour (after receiving the dose), while 85 percent will be out of action by the end of the

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first 24 hours (i.e., by this time a unit or subunit will
have lost its combat effectiveness completely).      50X1-HUM

The following factors, in addition to the length of
time spent on radioactively contaminated terrain, influence
the amount of the dosage:  the yield of the nuclear warhead,
the distance of the target from the center of the burst, the
average wind direction and velocity, the degree of cover
(protection) of personnel, the type of ground on which the
burst occurs, forested areas in the path of the fallout
pattern from the cloud, atmospheric precipitation during
formation of the radioactive fallout pattern, and other
factors.

The first four factors are taken into account directly
in the calculation formulas for determining the radiation
doses which are correct for non-friable soils (clay, loam,
rock), for exposed and semi-exposed terrain, and for when
there is no atmospheric precipitation.  If nuclear bursts
take place on sandy soils, the level of radiation within the
fallout pattern from the cloud will increase on the average
by a factor of 2.5.  The degree of contamination of terrain
and atmospheric precipitation will increase to a certain
extent.

Large tracts of forest (because of the settling of
radioactive dust on the crowns of trees and because of the
screening effect of the forest) reduce the radiation level
by a factor of about two.  However, such protective features
are characteristic only of forested areas which have not
suffered the effects of a shockwave and thermal radiation;
the features are considerably weakened in a zone of massive
employment of nuclear weapons.

Before proceeding to set forth the essence of the
proposed methodology, let us examine the basic factors which
determine the effectiveness of using surface nuclear bursts.
The amount of damage inflicted upon the enemy will be
considerably affected by the degree of detection of the
grouping being destroyed, the average wind direction, the
location of our aiming points, and a number of other
circumstances, as well as by the number of missiles employed
and their yield.                              50X1-HUM

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Degree of detection (reconnaissance of targets.
Reliable knowledge of the position and nature of the
individual targets of the enemy grouping being destroyed
makes it possible to correctly determine the aiming points
of the missiles and to efficiently allocate the available
yields of nuclear warheads among the planned targets.
However, it is an exceptionally complicated task to
establish the position of all of the targets, let us say, of
a division located in a concentration area. At the same
time, there is no particular need to do this when delivering
a group nuclear strike (with 6 to 10 missiles).

An analysis of the effect of the degree of detection
(0) of the targets of a division located in a concentration
area on the effectiveness of a group strike (made on the
basis of comparative estimates) has shown that there will be
an appreciable increase in the average losses of a division
only if the degree of detection rises to 30 to 50 percent.
A further rise in this percentage will have no practical
effect on the effectiveness of a group nuclear strike. This
feature of dependence of average losses on the degree of
detection of individual targets is explained by the fact
that when 0 = 30 to 50 percent, a large portion of the
planned nuclear strikes are being delivered against specific
targets (and are consequently being employed with maximum
effectiveness). The expenditure of missiles in this case,
if the nuclear warheads are of equal yield, will be about
1.5 times less than when 0 = 0.

The average wind velocity and direction constitute
basic factors affecting the formation of the fallout pattern
of the nuclear cloud.

If nuclear strikes are delivered directly on a grouping
of troops, the average wind speed does not appreciably
affect the effectiveness of destroying it (although with an
increase in wind velocity, some increase in average losses
is noted. The average wind direction may strongly affect
the amount of damage inflicted on the enemy by acting on the
zones of radioactive contamination and expanding them beyond
the bounds of the grouping being destroyed, if the nuclear
strikes are planned without considering wind direction.
Thus, in computer simulation of a group nuclear strike
against an armored division in a concentration area

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(6 missiles with a yield of 100 kilotons each) with a change in wind direction from 180 to 270 degrees, there was a 10 percent change in the division's average personnel losses. This emphasizes the necessity for taking wind direction into account in planning a group nuclear strike with surface bursts.  This is all the more so since modern methods and means of providing meteorological support to the rocket troops make it possible to forecast the average wind in enemy territory to a depth of up to 300 kilometers.

The precision with which nuclear strikes are prepared influences the average troop losses mainly of those targets against which these strikes are directly delivered; the dominant factor in this case is not the effect of radioactive contamination of terrain but the effect of the main destructive elements of the nuclear burst (shockwave, thermal radiation, and penetrating radiation).

However, if only the general outlines of the area occupied by the enemy grouping are known ($\theta = 0$), and the aiming points are set uniformly for the whole area (taking terrain into account, of course), then effectiveness in destroying the grouping will not, for all practical purposes, depend on the accuracy of the preparation of the nuclear strikes.  However, it must be taken into account here that a low degree of detection of specific targets of the grouping being destroyed will have a considerable effect on the pattern of losses, since, in this case, destruction of personnel located in tanks, shelters, covered trenches and slit trenches will be extremely low.  Thus, if 6 nuclear strikes of 100 kilotons each are delivered against an armored division in a concentration area, with a uniform distribution of aiming points, then compared to a fairly high level of destruction of personnel in motor vehicles and armored personnel carriers (about 50 to 60 percent), losses of personnel in tanks will total only 10 to 20 percent.  The efforts of reconnaissance means must therefore be directed in the first instance toward the detection of tank (self-propelled artillery) units and  subunits.  Only then can we count on the most effective utilization of nuclear warheads in a group nuclear strike, and on the sure destruction of these very units and subunits.

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A group nuclear strike using surface bursts against a large enemy grouping is prepared and delivered by decision of the commander of the army (front); on the basis of analysis of reconnaissance data concerning the enemy, the situation, the nature of the tasks to be carried out by his own troops, and an estimate of the capabilities of the rocket large units (units), he determines the required degree of destruction, the number of missiles and their yields for the group nuclear strike, and fixes the time of the strike.

After the adoption of the decision for a group nuclear strike, the commander and staff of the rocket forces and artillery of the army (front) determine the coordinates of the aiming points and the sequence of the nuclear bursts, refine the estimates for the effectiveness of the nuclear strikes and for the safety of our troops, assign tasks to the commanders of rocket large units (units), and monitor the course of preparation for the strike.

Let us dwell in greater detail on the methodology for deciding the most important questions involved in preparing a group nuclear strike. As an example, let us examine the destruction of an armored division in its concentration area, for which a variant disposition of combat units is set forth in Figure 1. The following conditions, which we regard as typical, are assumed here. The enemy will require at least one hour to evaluate the radiation situation after the strikes and to withdraw his troops from the areas of radioactive contamination; the combat effectiveness of units (subunits) of ours which have been subjected to destruction by nuclear weapons will be estimated by the enemy for 24 hours and more ahead of the moment of delivery of the nuclear strikes; troops will be withdrawn from contaminated terrain in motor vehicles, armored personnel carriers, and tanks, with the use of individual means of protection.

In calculating the average personnel losses in each target (and the division as a whole), we used a method of statistical analysis based on a model worked out by Colonel S. B. Borshchevskiy.

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   The effectiveness of destruction of an enemy grouping
of forces is evaluated according to the number of combat
units and subunits destroyed (losing their combat
effectiveness).  When surface bursts are used, however, it
is fairly complicated to determine the estimated results of
the destruction of each separate target.  This can be done
most correctly and accurately only with full detection of
the grouping to be destroyed and with the use of computers.
At the same time, we can recommend a less complicated method
of estimating the effectiveness of surface nuclear bursts
which is accurate enough for practical use.  This method is
based on the fact that if several nuclear strikes are
delivered, and if the zones of destruction of the enemy
grouping cover the area to a sufficient degree (40 to 60
percent and more), then the extent to which the area is so
covered will coincide roughly with both the percentage of
combat units (subunits) put out of action and the percentage
of personnel destroyed.  If 30 to 50 percent or more of the
targets are known, the percentage of combat units (subunits)
and personnel put out of action will be equal to or slightly
greater than the percentage of the area covered by the
strike, while if $\theta = 0$, it will be less by an average factor
of 1.3.

   The graphs (Figure 2) set forth the average values for
an area covered, taking into account the radioactive
contamination of terrain for one surface burst.  The graphs
are drawn for fixed yields per nuclear warhead under the
most typical conditions of personnel deployment.

   The vertical axis of each graph shows the average value
for the area covered $S_n^1$ by one nuclear burst, and the
horizontal axis the distance R from the aiming point along
the axis of the fallout pattern up to the limit of the area
occupied by the grouping.  The curves correspond to the
different types of protective cover of personnel.

   For a given type of personnel cover, and observing the
distances recommended below between the axes of the fallout
patterns from the radioactive cloud, the average value of
the area covered $S_n$ by several bursts is determined      50X1-HUM
according to the formula

$$S_n = S_{n1}^1 + S_{n2}^1 + \ldots + S_{nn}^1 , \tag{1}$$

where $S_{n1}^1$, $S_{n2}^1$, ..., $S_{nn}^1$ represent the average value of the area covered by the first, second, ..., through the $n^{th}$ 50X1-HUM bursts.

If the personnel within the grouping being destroyed are deployed in shelters of various types, the average area covered by the strike will be determined as the sum of the products of the proportion of personnel deployed in a given type of shelter multiplied by the average area covered by all bursts, to be calculated according to the formula (1) for the given type of shelter, i.e.

(2)

$$S_n = K_1 S_{n1} + K_2 S_{n2} + \ldots + K_n S_{nn},$$

where

$S_{n1}$, $S_{n2}$, ..., $S_{nn}$ represent the average area covered from all bursts for the first, second, ... through the n type of personnel shelter;

$K_1$, $K_2$, ..., $K_n$ represent the proportion of personnel deployed in shelters of different kinds.

For armored, mechanized, and infantry divisions of our probable enemy, the following values of the coefficients K may be taken as average.

Values of the Coefficients K

Table 1

| Type of personnel shelter | Armored Division | Mechanized Division | Infantry Division |
|---|---|---|---|
| In tanks | 0.3 | 0.15 | 0.10 |
| In armored personnel carriers and combat infantry vehicles | 0.5 | 0.6 | 0.05 |
| In motor vehicles | 0.2 | 0.25 | 0.85 |

The value of the coefficients set forth in Table 1 is derived from the conditions of destroying the main elements of the combat units and subunits of the indicated large

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units:  in a tank battalion, personnel are destroyed in
tanks; in a motorized infantry battalion--in their armored
personnel carriers, etc.

The percentage of area covered is determined as the
relationship of the covered area to the area occupied by the
given grouping.

As noted above, when 30 to 50 percent or more of the
targets are detected, the percentage of combat units and
subunits put out of action ($M_{b.n}$ ) and personnel destroyed
($M_{zh.s}$ ) is taken as equal to the percentage of area
covered, while if the detection is near zero, it is taken as
equal to the percentage of area covered reduced by a factor
of 1.3.

Example 1.  Estimate the effectiveness of the
destruction of an armored division, in its concentration
area (when $\theta$ = 100%), deployed over an area of 450 square
kilometers (Figure 1), if it is planned to deliver 7 nuclear
strikes against the following targets:  the 1st Tank
Battalion, 2nd Tank Battalion, 3rd Tank Battalion, 3rd
Motorized Infantry Battalion, 4th Motorized Infantry
Battalion, 6th Tank Battalion, and a Battalion of Honest
John missiles; the yield of nuclear warheads is 100 kilotons
each, surface bursts, and average wind direction (direction
toward which wind is blowing) 225 degrees.

Solution.  The distance R is measured off on the map,
following the average wind direction from the planned aiming
points up to the borders of the area occupied by the
grouping.  The average value for the area covered by one
burst $S_n^1$ is then determined for these measured distances
from the graph (Sketch 2,a), and the average area covered $S_n$
from all bursts is calculated according to formulas (1) and
(2) using the coefficients in Table 1.  The sequence of
calculations is set forth in Table 2.

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Table 2

| Targets of nuclear strikes | Distance $R$, in km | Average areas $S_n^i$ covered | | |
|---|---|---|---|---|
| | | Personnel in tanks | Personnel in armored personnel carriers | Personnel in motor vehicles |
| 1st Tank Bn (No. 1) | 23 | 20 | 40 | 72 |
| 2nd Tank Bn (No. 2) | 18 | 20 | 40 | 66 |
| 3rd Tank Bn (No. 4) | 14 | 20 | 37 | 56 |
| 3rd Motorized Inf Bn (No.7) | 18 | 20 | 40 | 66 |
| 4th Motorized Inf Bn (No.9) | 10 | 19 | 28 | 44 |
| 5th Motorized Inf Bn (No.14) | 7 | 13 | 21 | 35 |
| Bn of free-flight rockets (No. 18) | 4.5 | 11 | 14 | 27 |
| According to formula (1) | | $S_{n1} = 125$ | $S_{n2} = 220$ | $S_{n3} = 366$ |

According to formula (2) $S_n = 0.3 \cdot 125 + 0.5 \cdot 220 + 0.2 \cdot 366 = 220.7$ km$^2$

$$S_n = \frac{220.7}{450} \cdot 100 \simeq 49\%.$$

Since the example assumes $\theta$ to be greater than 30%, then taking into account the detection of the targets, the coefficient $K_\theta = 1$, and hence $M_{b.p.} \simeq M_{zh.s.} \simeq 49\%$.

For comparison, Table 3 sets forth the results of calculating the average value for personnel destroyed for each target, obtained by the method of statistical analysis. As may be seen from the table, errors in calculating the effectiveness of destruction of personnel will not exceed 5% with this method.

Table 3

| Targets | M% | Targets | M% | Targets | M% |
|---|---|---|---|---|---|
| 1st Tank Bn | 54 | 4th Motorized Inf Bn | 66 | HQ, 3rd Brigade | 49 |
| 2nd Tank Bn | 52 | 4th Tank Bn | 2 | Bn of free-flight | |
| 1st Motorized Inf Bn | 61 | 5th Tank Bn | 13 | rockets | 93 |
| 3rd Tank Bn | 60 | 2nd Artillery Bn | 47 | Artillery Bn | 40 |
| 2nd Motorized Inf Bn | 58 | HQ, 2nd Brigade | 70 | HQ, armored div. | 35 |
| 1st Artillery Bn | 80 | 6th Tank Bn | 54 | Recon Bn | 28 |
| 3rd Motorized Inf Bn | 91 | 5th Motorized Inf Bn | 6 | | |
| HQ, 1st Brigade | 54 | 3rd Artillery Bn | 42 | $M_{zh.s.} = 51\%$ | |
| | | | | $M_{b.p.} = 57\%$ | |

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Determining the expenditure of missiles with nuclear warheads.  As the basis for an approximate methodology for determining the expenditure of missiles with nuclear warheads, the method was adopted of comparing the area which must be covered by the destruction zones of surface nuclear bursts (with a given degree of destruction) with the destruction zone of one burst of a given yield.  Figure 3 gives the size of the average area covered by one burst, in relation to the distance R, for various nuclear warhead yields and various large units of our probable enemy.

From these graphs it may be seen that with surface nuclear bursts, the effectiveness of warheads with a yield of 10 and 20 kilotons is less by an average factor of 5 and 2.5, respectively, than that of warheads with a yield of 100 kilotons; consequently the expenditure of these nuclear warheads will be greater by the same factors.  It is therefore inadvisable to use nuclear warheads of less than 20 kilotons in surface bursts; they can be used for aerial bursts against targets lying near the border of the area occupied by the grouping and not already covered by the zone of radioactive contamination of terrain.

The procedure for solving the given problem is as follows:  the required level of destruction of the enemy grouping $M_{tr}$ is established, after which the area which must be covered with destruction zones $S_{n.tr}$ is determined (taking into account the coefficient $K_\theta$, which depends on the degree of detection of the targets within the grouping to be destroyed).  In this we use the formula

$$S_{n,tr} = K_\theta M_{tr} S_n ,$$ (3)

where $S_n$ is the area occupied by the enemy grouping.

Since one of the accepted rules is a more or less uniform distribution of aiming points, we can assume that the sum of the distances from the aiming points to the border of the area of the grouping, divided by the number of aiming points, is approximately equal to the radius of a circle equal in area to the area of the grouping being destroyed, i.e.

$$R_{sr} = \sqrt{\frac{S_n}{\pi}} .$$

According to the value of $R_{sr}$ and the yield of the nuclear warheads which can be used to deliver the group nuclear strike, the size of the area to be covered by one nuclear burst $S_n^1$ is found on the graph (Figure 3).

If nuclear warheads of identical yields are used for the delivery of a group nuclear strike, the number of warheads equals

$$N = \frac{S_{n,\,tr}}{S_n^1} \quad . \tag{4}$$

If nuclear warheads of different yields are used for delivery of the strike, the number of warheads is determined by the fact that the area to be covered is equal in size to the area covered by the zones of surface nuclear bursts of different yields (for a given value of $R_{sr}$).

Aiming points are designated in conformity with the recommendations set forth below, in which the aiming points for the lesser yields are designated closer to the borders of the area of the grouping from the downwind side.

Example 2. Determine the expenditure of missiles for the destruction of 60% of the combat units and subunits of an armored division, in its concentration area, deployed over an area $S_p = 400$ km$^2$, if only the area occupied by the division ($\theta = 0$, and $K_\theta = 1.3$) is known. The actual distribution of targets corresponds to Figure 1. To carry out this task we may employ six missiles, each with a nuclear warhead of 300 kilotons or six missiles, each with a warhead of 100 kilotons.

Solution 1. We determine the value

$$R_{sr} = \sqrt{\frac{S_p}{\pi}} = \sqrt{\frac{400}{3.14}} \approx 11 \text{ km.}$$

2. From the graph (Figure 3,a) for $R_{sr} = 11$ km, we determine the average area covered by one burst: for 300 kilotons--40 km$^2$, for 100 kilotons--30 km$^2$; using formula (3), we calculate the required area to be covered by destruction zones

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$$S_{n,tr} = 1.3 \cdot 400 = 310 \text{ km}^2.$$

3. In order to reduce the total number of missiles used for a group strike, we first make a calculation for nuclear warheads of greater yields (having in mind 6 missiles, each with a nuclear warhead of 300 kilotons and determine their area of coverage

$$S_n = 6 \cdot 40 = 240 \text{ km}^2.$$

4. The difference between $S_{n,tr}$ and $S_n$ is 310 - 240 = 70 km$^2$. From formula (4) we determine that to cover this area two more missiles are needed (70:30 ≈ 2), each with a nuclear warhead of 100 kilotons.

Thus the total expenditure comprises 8 missiles: 6 missiles of 300 kilotons each and 2 missiles of 100 kilotons each.

The location of the chosen aiming points is shown in Figure 1, in which aiming points No. 7 and No. 8 are designated for the missiles with a nuclear warhead of 100 kilotons each.

For comparison, Table 4 sets forth the results of calculating the average value of destruction of personnel for each target in a division (results obtained by the method of statistical analysis for an instance in which their actual disposition is known); the results also confirm the high accuracy of the proposed method of determining the required number of missiles (the average error in determining the effectiveness of destruction of a grouping does not exceed 2% in comparison with that given here).

Table 4

| Targets | M% | Targets | M% | Targets | M% |
|---|---|---|---|---|---|
| 1st Tank Bn | 1 | 4th Motorized Inf Bn | 77 | HQ, 3rd Brigade | 38 |
| 2nd Tank Bn | 20 | 4th Tank Bn | 32 | Bn of free-flight | |
| 1st Motorized Inf Bn | 72 | 5th Tank Bn | 52 | rockets | 91 |
| 3rd Tank Bn | 15 | 2nd Artillery Bn | 86 | Artillery Bn | 87 |
| 2nd Motorized Inf Bn | 65 | HQ, 2nd Brigade | 81 | HQ, armored div | 63 |
| 1st Artillery Bn | 36 | 6th Tank Bn | 10 | Recon Bn | 92 |
| 3rd Motorized Inf Bn | 75 | 5th Motorized Inf Bn | 18 | | |
| HQ, 3rd Brigade | 81 | 3rd Artillery Bn | 74 | | |

$$M_{zh.s} = 54\%$$
$$M_{b.p.} = 62\%$$

Designating the aiming points. The general rules for determining the aiming points for a group nuclear strike are as follows.

When the degree of detection of individual targets within the grouping to be destroyed is sufficiently high (0 = 30 to 50% and more), the centers of the most important targets are taken as the aiming points; first and foremost the centers of tank battalions, battalions of free-flight rockets and guided missiles, and divisional and brigade control organs (posts).

If the position of individual targets is not known, the aiming points are chosen in areas (sectors) in which these targets are most probably located on the basis of local terrain conditions.

In both instances, it is advisable to distribute the aiming points more or less uniformly over the entire area being destroyed. This will achieve surprise in use and, at the same time, the action of nuclear weapons on all the troops of the given enemy grouping.

In order to keep from laying down excessive zones of radioactive contamination of terrain, the distance between the axes of the fallout patterns from the radioactive clouds of adjacent bursts must be at least 3 to 4 kilometers. To do this, the average wind direction must be taken into account.

The timing of the nuclear bursts (in relation to each other) is determined by the staff of the rocket troops and artillery, in accordance with the established time frame for delivering a group nuclear strike. The launching time for each missile is set by the commanders of the rocket units (large units).

In order to prevent failure of a warhead fuze device or premature initiation of the nuclear device (which may happen if a nuclear warhead passes through a radioactive cloud formed by a previous nuclear burst), it is advisable to deliver the strikes successively, beginning with the most distant targets, at an interval of one or two minutes. If the plan is for all nuclear bursts to occur simultaneously,

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the distance between adjacent aiming points must be at least
5 kilometers for warheads of 100 kilotons and 6.5 kilometers
for warheads over 100 kilotons. 50X1-HUM

It has been noted above that, when surface nuclear
bursts take place, there is formed, within a certain time
from the moment of delivery of a group nuclear strike, a
dangerous zone of radioactive contamination expanding beyond
the limits of the area of the grouping being destroyed and
drawn out for 100 to 150 kilometers and more in the
direction of the wind. In negotiating this zone, enemy
personnel may receive such doses of radiation as to
significantly reduce the combat effectiveness of his troops.
This is borne out by the following example.

Let us suppose that one hour after the delivery of a
group nuclear strike by eight missiles with a yield of 300
kilotons each, with surface bursts, an enemy infantry
division whose personnel are predominantly in motor vehicles
advances toward a zone of radioactive contamination 50
kilometers from the area of destruction. Under these
conditions the division can begin to negotiate the
contaminated zone (without exposing itself to a dose of more
than 50 roentgens) only about 5 hours after advancing toward
it.

If the enemy nevertheless starts to negotiate this zone
from the march, then, considering their means of transport
($K_{asd}$ = 2), the personnel will receive a dose equal to 240
roentgens. As a result, up to 15% of the division's
personnel will be put out of action by the end of the first
24 hours.

Research shows that the use of surface nuclear bursts
with a yield of 100 kt and more, under conditions providing
for the safety of our own troops, will be an effective means
of destroying enemy groupings, of making it impossible for
enemy troops to maneuver widely, and of delaying the
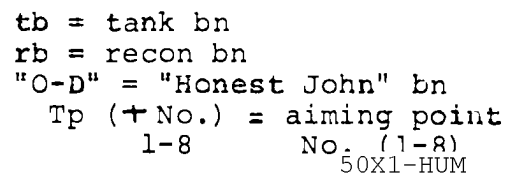approach of reserves and the bringing up of materiel.

The methodology proposed in this article makes possible
a quantitative evaluation of the effectiveness of surface
nuclear bursts in order to provide an adequate basis 50X1-HUM
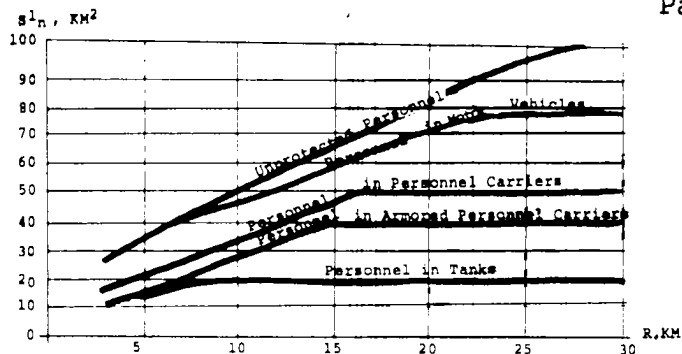planning their use in group nuclear strikes.

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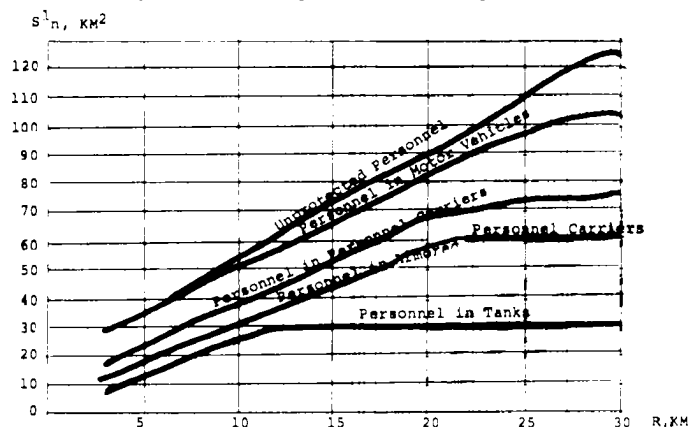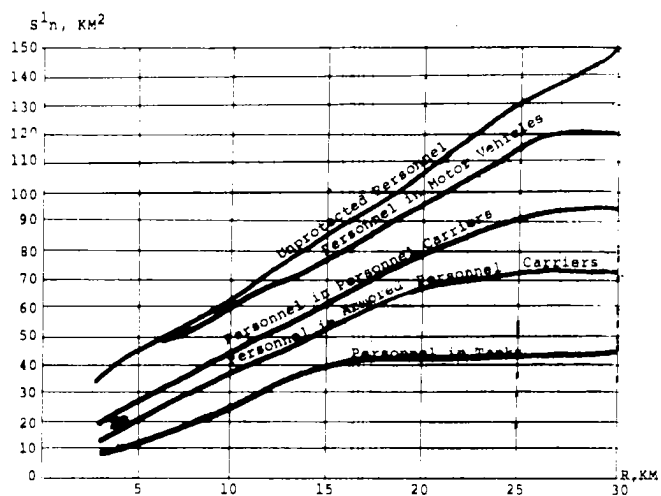TOP SECRET

Figure 1. Armored division in its concentration area (variant)

mpb = motorized inf bn             tb = tank bn
adn = artillery bn                 rb = recon bn
brtd = armored tank division       "O-D" = "Honest John" bn
br = brigade                       Tp (+ No.) = aiming point
                                   1-8        No. (1-8)

$s^1{}_n$, KM²



a) Average area covered by one burst with a yield of 100 kt.

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$s^1{}_n$, KM²



b) Average area covered by one burst with a yield of 200 kt.
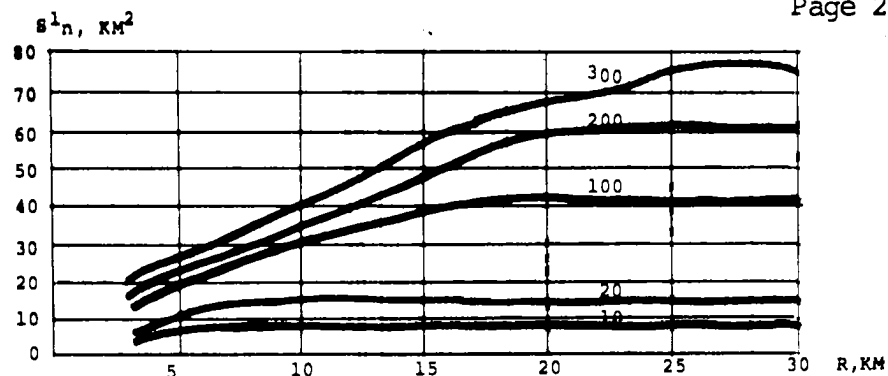
$s^1{}_n$, KM²



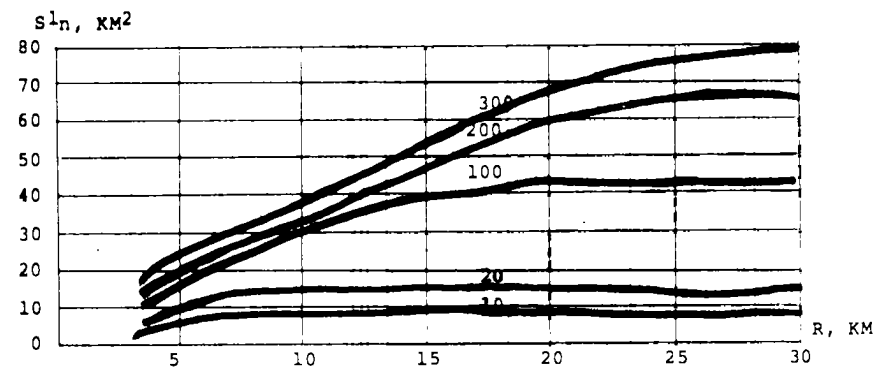c) Average area covered by one burst with a yield of 300 kt.
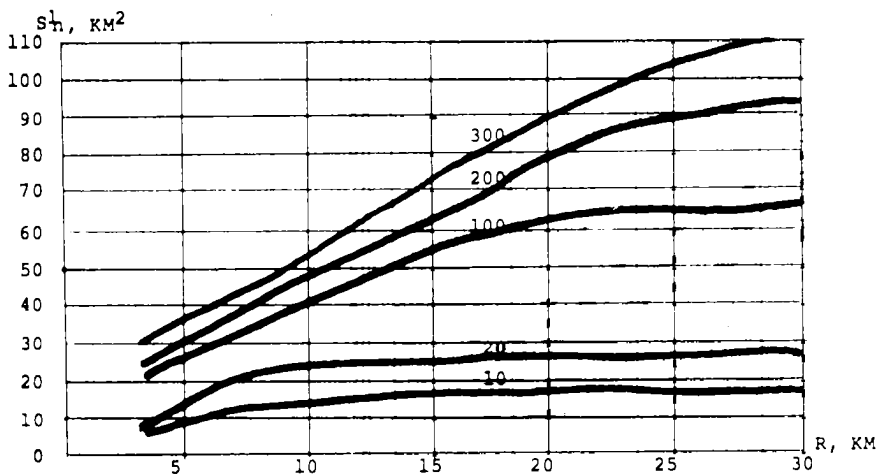
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Figure 2

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a) Average area to be covered by one burst of 10, 20, 100, 200, or 300 kt against an armored division.



b) Average area to be covered by one burst of 10, 20, 100, 200, or 300 kt against a mechanized division.



c) Average area to be covered by one burst of 10, 20, 100, 200, or 300 kt against an infantry division.

50X1-HUM

Figure 3